

04 April, 2001

## MODIS sensor Working Group (MsWG) Summary

**Attendance:** Bill Barnes, Bruce Guenther, Eric Vermote, Gary Toller, Jack Xiong, Jim Young, Mike Roberto, Roger Drake, Steve Platnick, Zhengming Wan, Gwyn Fireman

**Guest:** Eugene Waluschka, GSFC, 301-286-2616

### Scheduled Items

SD illumination on VIS FPA:

Eugene Waluschka explained how his team modeled SD illumination of the VIS FPA. Each of three models used ray tracing of a large number of rays generated to originate from random positions

- within SD attenuation screen pinholes to simulate screen-down (+/- 0.25 degrees = solar cone angle);
- within the SD screen aperture (bounding box) to simulate screen-up;
- within a dummy plane perpendicular to the optical axis to remove effects of Solar Diffuser plane and optics (plots not distributed).

The results were binned to 10 by 12 arrays, with about  $10^5$  rays per binned pixel.

1. Shows uneven illumination of the VIS FPA, with variation about 5%
2. Shows uneven illumination of the VIS FPA, with variation about 4.5%
3. Shows uneven illumination on FPA.

Dr. Waluschka also distributed an exaggerated ray tracing showing how the telescope optics collimate incident light so exiting rays are parallel, but have an exit angle dependent on the angle of incidence. The telescope optics introduce coma and distortion.

It is possible that non-uniform illumination may account for systematic variation along detectors observed in ocean bands. An M1 correction factor could be derived for each focal plane to account for the different SD illumination geometries.

Action 0104-01: The optics group, MCST and SBRs should continue analysis for all FPAs.

Action 0104-02: Examine pre-launch data to identify any slope in detector direction.

Action 0104-03: Prepare a rough draft of the SPIE paper describing the non-uniform illumination effect.

RSB Degradation Implementation:

Points clarified:

- Plotted values are ratios, so systematic errors cancel. Statistical errors are RMS'd together.

- Little difference is expected between plots wrt elapsed time and SD exposure time, since SD measurements were taken regularly.

[Action 0104-04: Capture recent conclusions in a memo.](#)

Ongoing concerns:

- While initial mirror side differences and subsequent deposition and solarization may affect differential mirror side degradation, we do not yet have a way to understand those effects.

Action 0104-05: Proceed with MISR study to find if MS differences at nadir are the same as at the SD angle.

---

Validation:

Weileuke at NOAA reports that desert observations show up to 6% reflectance difference between Bands 1 and 2 and ATSR, well above the 2% spec. Arizona's validation shows MODIS is within 1%.

[Action 0104-06: MCST will look into apparent validation differences.](#)

## **Around the Table**

**Wan (by email):**

Expresses concern about higher-frequency variations in the degradation study.

Although the Lake Tahoe scene under study appears to be clear, cloud mask shows thin cirrus. More work is needed before deciding whether to believe the cloud mask. Vermote sees aerosols as more pervasive than thin cirrus.

**Platnick:**

Asked about the status of the SWIR striping and crosstalk study. Xiong reports that the first SRCA test did not produce good enough data; SWIR bands registered thermal IR from SRCA lamps turned off but still hot.

[Action 0104-07: Schedule another SRCA lamp-off test with revised strategy.](#)

Other SWIR striping discussion:

- SBRS couldn't explain large variations in DN taken at a single radiance level.
- When and how should an empirical correction to SWIR band striping be applied?
- Striping is scene-dependent
- Difference between scan lines > expected uncertainties
- SDST needs best striping correction by May 1 for year code freeze
- Can Band 26 data be used to identify cause of striping?

- Problem: preflight data was taken before SAM resistor change
- SBRS believes 2<sup>nd</sup>-order fit term is in detector, not electronics, though for MWIR bands the 2<sup>nd</sup> order terms changed with new SAM resistor.
- Since SWIR bands are on same FPA as MWIR bands, shouldn't SWIR bands use quadratic calibration as do the MWIR bands?
- Could well voltage be useful in modeling nonlinearity?

Action 0104-08: SBRS will continue fits of B26 preflight data to quadratic, and higher-order polynomials; these show smaller residuals than linear fits.

Action 0104-09: SBRS will assign weights to fit data and find coefficient uncertainties

Action 0104-10: Platnick will look at granules taken during B5 gain change to see if non-linearity is a function of gain.

The Band 5 gain change resulted in acceptable saturation levels. If the remaining saturation appears in equatorial regions, then the proposed gain change is acceptable. Platnick would like to examine striping in Bands 5 and 6 during the gain change.

Action 0104-11: Deliver L1B granules recorded during Band 5 gain change to Platnick.

Action 0104-12: Find latitude of regions saturating during Band 5 gain change.

Action 0104-13: Derive M1, R\*, and thermal leak coefficients for new Band 5 gain.

**Vermote:**

Q: When will new LUTs be delivered for SAFARI reprocessing? A: Most likely next week with code change.

**SBRS:**

Sent written request for LWIR bias sweep on April 3, 2001. They haven't been able to retrieve the LWIR ITWK/VDET sweep for the initial operation configuration.

Action 0104-14: Check for ITWK/VDET sweep data.

**Xiong:**

Has been in communication with SBRS regarding possible LWIR PC band 1/f noise; only white noise has been identified. Drake indicates that 1/f noise would originate in the detectors, while white noise originates in electronics.

*compiled by G. Fireman 04 April, 2001*